New Bedford Harbor Superfund Site

Aerovox Interim Cap

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Silver Lake

At EPA's request the Aerovox Cap Design reviewed the GE Pittsfield Silver Lake Cap Design and used it as a starting point:

- Silver Lake – 26 acres max water depth of 30 ft
- Surrounded by residential and commercial properties
- Located in Pittsfield, MA
- Receives storm water discharges from municipalities
- Discharges through a 48 inch RCP to the Housatonic River
- COCs included PCBS, benzidine, 2-chloroethyl vinyl ether and 1,2 – diphenylhydrazine.

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Silver Lake Specifics

Pre-Cap Criteria

Activities included:

- Identification and sampling of candidate isolation layer materials
  - > Materials were required to be a silty sand with total organic carbon (TOC) at a minimum of 0.5%
- Installation of erosion controls and turbidity barriers
- Establishment of materials and equipment staging areas
  - > Staging areas used for on-shore slurry operations; barge and workboat launches; and preparation, mixing, and staging of the isolation layer materials
  - > The staging area consisting of on-shore slurry operations was lined with non-woven geotextile, an impermeable liner, and a minimum six inches of gravel, while the other staging area was lined with non-woven geotextile and covered with gravel
- Construction of isolation layer slurry operations
  - > Dry mixed isolation layer materials were mixed with water from the nearby lake

Cap Design

Three options of material underlying the isolation layer were reviewed and analyzed to determine the best material for the constructability and performance of the cap.

No Geotextile

- The isolation layer was placed directly on the sediment

Non-Woven Geotextile

- Used a Mirafi 180N non-woven geotextile fabric
- Difficulties with placing the geotextile included puckering and necking in association with the buoyancy of the material
- Sandbags and textile placed with rebar were used in remediation efforts of the original placement

Geocomposite Area

- Consists of two non-woven geotextile layers sewn together and filled with a less than one inch layer of a sand/organo-clay mix with a TOC similar to the isolation layer materials
- While initially the geocomposite was expected to sink into place because of its weight, puckering and folding still occurred. This initiated the use of 10-foot sections of #4 steel rebar fastened every 10 feet as well slowing barge speed to remediate the issues that arose

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Silver Lake Specifics continued

Cap Design

- A barge mounted dissipater/spreader assembly was used to spread the mixed dry isolation layer material to the lake bottom
- Mixed dry isolation layer material was carried in the slurry to the barge by pipe where it then had its energy dissipated (i.e. perforations in the pipe directed at a steel plate, intermittent corrugated riffles) prior to being dropped through the water column
- The isolation layer was initially placed in one inch lifts but was then modified to two inch lifts for the final lifts
- Alongside cap design, GE used shoreline protection measures to protect the cap from potential erosion
  - > A woven geotextile layer was added to the top of the cap and anchored into the bank before a twelve inch thick armor stone layer was constructed along the bank
  - > Three inches of process sand and gravel were placed over the armor stone to act as a habitat layer

Post-Cap Criteria

- Sediment collection pans, sediment profile imaging, acoustic sub-bottom profiling, and cap probing were used to determine the lift thickness placed by the contractor which was then compared to the goal lift thickness
- It was concluded that the rate or extent of settlement was not influenced by the presence of a geosynthetic layer
- When cap materials were placed in thin lifts, GE found a relatively uniform, slow rate of settlement, with no indication of sediment instability
- The non-geosynthetic test areas allowed for mixing of contaminated sediment and isolation layer materials within the first two inches
- The capping design approach resulted in lower PCB concentrations during the construction process than the baseline concentrations

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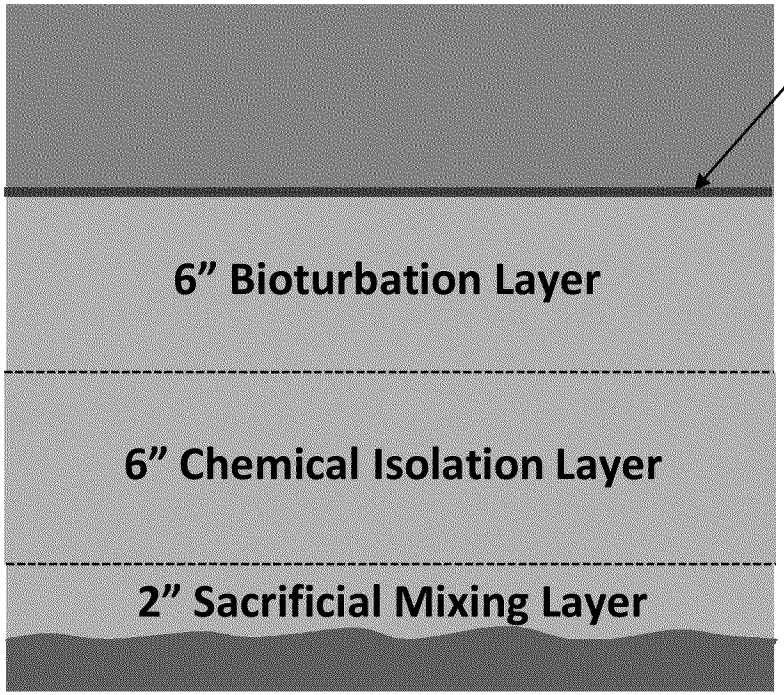

In-lake portion: no geotextile or armor stone

NOTE: cap performance std of 0.5% TOC <u>measured in place</u>

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While the physical processes affecting contaminant transport in sediment caps are readily modeled, fate and transport processes mediated by the following are location-specific:

- Wave Action, Tide Effects, Storm Surge and Erosion
- COCs and Concentration Levels (CVOCS and PCBs)
- Bioturbation (Location-Specific Aquatic Organisms)
- Ebullition

Also need to consider:

- Consolidation and bearing capacity of loose organic sediment and potential marine clays beneath it
- Lifespan of Cap
- Physical presence of NAPL in sediment
- Salinity

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Jacobs has reviewed available publications and design documents including:

- EPA/ITRC Design Criteria
- USACE Design Criteria
- Sweden Design Criteria
- NAVFAC Design Criteria
- GE Pittsfield Design Criteria
- Draft Design Memorandum by Lally Consulting

Jacobs is conducting initial cap designs using CapSim and Reible modeling software.

The following slide is an example of the CapSim output using estimated values.

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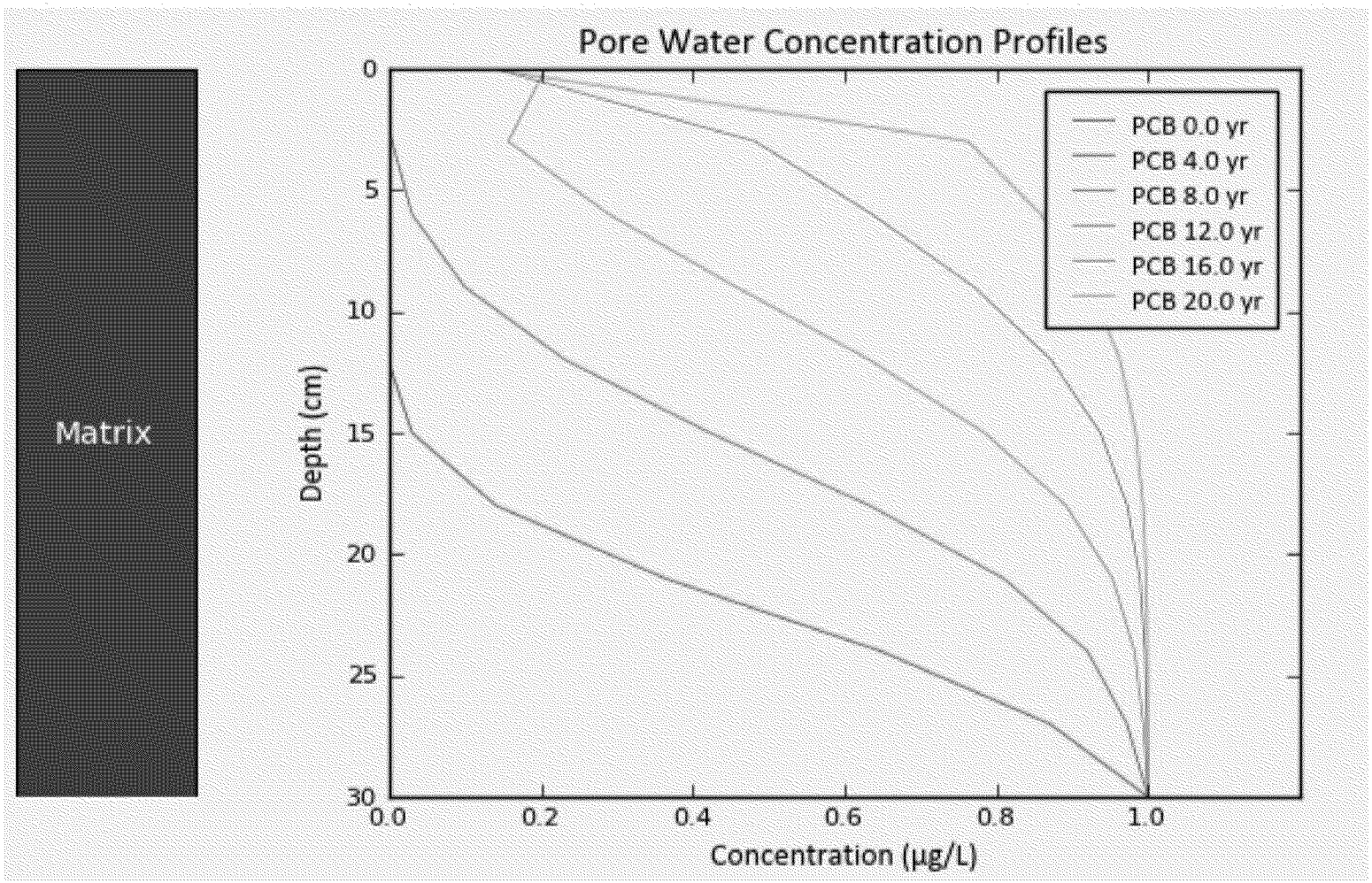

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For Construction:

- Internal Jacobs discussion:
- Reviewing benefits and cost for installation of geotextile or mats
- Installation of sand media with possible augment (i.e. carbon, top soil, organic material)
- Installation of armor layer near shore or areas of wave and scour forces
- Covering or smoothing of variable harbor bottom elevations
- Evaluation of benefits and cost for cap life span for 5 years, 15 years or 30 years